**Tropic responses.**—In working out the phototropic responses of *Avena sativa*, ARISZ[10] believes he has shown that the terms reaction time, presentation time, threshold of stimulation, etc., do not represent any well-determined end points in tropic responses. Quotations from his paper present his conclusions: "Each quantity of energy reacts on the plant and is expressed by a curvature of definite maximum strength." "If we once more trace how far the above investigations influence our conception of the process of stimulation, it is clear that the similarity to physico-chemical processes becomes more and more marked. The existence of a threshold of stimulation can no longer be maintained, for not only is each quantity of energy perceived, but it is clear now that a reaction will always take place. The time which intervenes between the application of the stimulus and the beginning of the curvature, the 'reaction time,' was found to be experimentally undeterminable. Thus the latter cannot serve as a measure of sensitivenesss."

We are urged, then, in this stronghold of stimulus physiology (tropisms), to abandon the stimulus conception for the physico-chemical. BLACKMAN had earlier urged such a shift of viewpoint in the study of metabolic processes of plants.—WILLIAM CROCKER.

**The cytology of rice.**—Since closely related species or even races of a given species may show differences in chromosome characters, several races of rice (*Oryza sativa*) were selected by KUWADA[11] for a cytological study. Just before synapsis in the pollen mother cell, a number of chromatin masses, about equal to the diploid number of chromosomes, are found scattered throughout the nuclear cavity. The masses, which are constantly paired, stretch out into double threads, which remain double during synapsis, but fuse after the synaptic stage is past. Soon after synapsis, the single thread arising from the fusion again becomes double and segments into 12 bivalent chromosomes, or gemini, and throughout the prophases the two parts of the bivalent chromosomes remain in parallel association, while they become shorter and thicker. Even in the homotypic division paired chromosomes, forming pseudogemini, occur. In the diploid generation the chromosomes are always paired and the number is 24. The development of the embryo sac presents nothing unusual. There are at first three antipodals, but, as in other Gramineae, the number becomes much larger at a later stage in the development.—CHARLES J. CHAMBERLAIN.

**Physics of transpiration.**—RENNER[12] has already shown that in still air evaporation from surfaces of like shape but different size varies more nearly

[10] ARISZ, W. H., On the connection between stimulus and effect in phototropic curvatures of seedlings of *Avena sativa*. Reprint from Proc. Konink. Akad. Wetensch. Amsterdam. March 25, 1911.

[11] KUWADA, YOSHINARI, A cytological study of *Oryza sativa* L. Bot. Mag. Tokyo **24**:267–281. *pl. 8.* 1910.

[12] Rev. in BOT. GAZ. **51**:156. 1911.

in proportion to the like linear dimensions of the surfaces than in proportion to the surfaces. He has also shown that for equal surfaces isodiametric surfaces give least evaporation, and that the greater the deviation from the isodiametric the greater the evaporation. These facts are related to the water vapor cap over the evaporating surfaces, a thing to which RENNER gives great importance in the absence of air currents. He concludes that the deviation from the linear dimension law, under conditions cited in the first sentence, is in large part due to convection currents set up by the moist air over the evaporating surface being less dense than the surrounding dry air. In the present work,[13] by means of wet filters and water surfaces, RENNER studied in great detail the effect of shape, size, position, and proximity of evaporating surfaces in both still and moving air. Later he expects to carry these studies over to leaves, where the part played by internal regulation can also be determined.—WILLIAM CROCKER.

**Theories of heredity.**—In a discussion of two theories of heredity, that the nucleus is and that it is not the sole bearer of hereditary qualities, LUNDEGÅRD[14] devotes most of his space to a study of the literature, but also describes the various constituents of the cell in root tips of *Vicia Faba*. In the first part of the paper he comes to the conclusion that the nucleus cannot be the sole bearer of hereditary characters, but that extra-nuclear structures must be considered. To the reviewer, the arguments do not seem conclusive. The second part deals with the structures variously known as mitochondria, chondriomitria, chondriosomes, etc., and with plastids and other bodies and substances found in cells. He believes that the mitochondria do not come from the nucleus, and that they are not bearers of hereditary qualities. Here again the reviewer is not convinced and, in the present state of the subject, is inclined to think that at least some of the bodies known as mitochondria are of nuclear origin. Plastids also are considered, and the view of SCHIMPER and others, that the plastid is a permanent organ of the cell, is upheld.—CHARLES J. CHAMBERLAIN.

**Heterochromosomes.**—That there is a differentiation among chromosomes has been recognized for some time by zoologists, but it is only more recently that botanists have turned their attention to the subject. In the wild mulberry (*Morus indica*) TAHARA[15] finds, in early stages of prophase in sporophyte nuclei, paired chromatin masses which may be called pronuclei, and even at

[13] RENNER, O., Zur Physik der Transpiration. Ber. Deutsch. Bot. Gesells. **29**: 125–132. 1911.

[14] LUNDEGÅRD, HENRIK, Ein Beitrag zur Kritik zweier Vererbungshypothesen. Ueber Protoplasmastrukturen in den Wurzelmeristemzellen von *Vicia Faba*. Jahrb. Wiss. Bot. **48**: 285–378. *pls. 6–8*. 1910.

[15] TAHARA, MASATO, Ueber die Kernteilung bei *Morus*. Bot. Mag. Tokyo **24**: 281–289. *pl. 9*. 1910.